definition of the limits of the invention, for which reference should be made to the appended claims.

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings, wherein like reference numbers identify similar elements throughout the several views:

FIG. 1 is a schematic cross-section through an apparatus for the gasification of contaminated used oils slightly loaded with solids;

FIG. 2 is a schematic cross-section through an apparatus for the gasification of material with low solid content; and

FIG. 3 is a schematic cross-section through an apparatus with a downstream waste-heat boiler.

DETAILED DESCRIPTION OF THE PRESENTLY PREFERRED EMBODIMENTS

FIG. 1 shows an apparatus having a gasification reactor with a reaction chamber 2 that allows contaminated used oils slightly loaded with solids to be utilized in an environmentally friendly manner by the production of raw gasification gas at 26 bar and approximately 1500° C. In its upper part, the reactor has a refractory-grade lining 3. In the lower part of the reactor, the lining 3 passes over into a helically coiled pipe of a floor cooling system 4, whose windings are connected to each other by pieces welded in a gas-tight manner so as to form a wall. The floor cooling system 4 has a cylindrical part and a spherical part. A cooling water supply and extraction system 5 includes pipes arranged in the container mantle for supplying and extracting cooling water to and from the floor cooling system 4.

An outlet cooling means 6, which forms the discharge opening for raw gas and slag, is arranged centrally on the lower floor of the reactor. A slag drain edge 7 is located on the lower part of the outlet cooling means 6. In the illustrated embodiment, the water of the outlet cooling means 6 is supplied and extracted through the container mantle from the pressure chamber via pipe 8. In principle, it is also possible for water to flow through the floor cooling system 4 and the outlet cooling means 6 in a serial connection. A cooling and washing stage 9 is connected to the reactor in the downward direction.

Assembly spaces between the floor cooling system 4, the outlet cooling means 6 and the metallic pressure container of the reaction chamber 2 or the refractory-grade lining 3 are sealed with a ceramic fiber material 10. The cylindrical mantle 14 is surrounded by a cooling mantle 11, through which water flows. The gasification media enter the reaction chamber 2 via a burner unit 1 and are converted in a flame reaction. The flame is ignited on the heated refractory-grade lining 3. The refractory-grade lining 3 and the floor cooling system 4 of helically coiled pipe are supported on a cooled carrier plate 12.

In another embodiment as shown in FIG. 2, the present invention has a reactor for the gasification of materials with low solid content. It is possible in this case for the floor to be made of only refractory-grade material and to have only the outlet opening be cooled.

The refractory-grade lining 3 of the reactor is supported on a cooled carrier plate 12. The outlet cooling means 6 has a tubular design, which ensures high flow speeds of the cooling water. As in FIG. 1, the slag drain edge 7 forms the lower seal of the reaction chamber relative to the cooling and washing stage 9.

In a further embodiment as shown in FIG. 3, the present invention has a gasification reactor with a downstream waste-heat boiler 13. Whereas in FIGS. 1 and 2 the sensible heat of the gasification gas leaving the reactor at approximately 1500° C. and that of the molten slag can be bound by the evaporation of water sprayed into the cooling and washing stage 9, here it can be advantageous, with respect to energy and technology, to use this sensible heat to produce high-pressure steam. For this purpose, the reactor types shown in FIGS. 1 and 2 are followed in FIG. 3 by a waste-heat boiler 13 rather than by the cooling and washing stage 9.

Thus, while there have shown and described and pointed out fundamental novel features of the invention as applied to preferred embodiments thereof, it will be understood that various omissions and substitutions and changes in the form and details of the devices illustrated, and in their operation, may be made by those skilled in the art without departing from the spirit of the invention. For example, it is expressly intended that all combinations of those elements and/or method steps which perform substantially the same function in substantially the same way to achieve the same results are within the scope of the invention. It is the intention, therefore, to be limited only as indicated by the scope of the claims appended hereto.

We claim:

1. A fluidized-bed reactor for gasification of combustion, residual and waste materials containing carbon and ash using an oxygen-containing oxidizing agent at temperatures above the melting point of the inorganic parts of said combustion, residual and waste materials at a pressure between ambient pressure and 60 bar, comprising:

a fluidized-bed reaction chamber;

a refractory-grade lining configured to form a first, upper part of said reaction chamber; and

a cooling wall configured to form a second, lower part of said reaction chamber, said cooling wall including cooling coils connected in a gas-tight manner, said cooling coils being coated with a heat-conducting ceramic layer and operated, while being cooled by pressurized water, below or above the boiling point of the cooling water, said refractory-grade lining and said cooling wall being joined in an overlapping fashion so as to compensate for different heat expansions.

2. The fluidized-bed reactor of claim 1, wherein said reactor is operated at a pressure between ambient pressure and 30 bar.

3. The fluidized-bed reactor of claim 1, wherein said cooling wall of said reaction chamber comprises a double-mantle design with a cooling space.

4. The fluidized-bed reactor of claim 1, wherein said second part of said reaction chamber includes a lower floor and a lower outlet opening.

5. The fluidized-bed reactor of claim 4, wherein said cooling wall of said reaction chamber is limited to said lower outlet opening.

6. The fluidized-bed reactor of claim 4, further comprising a cylindrical mantle surrounding said reaction chamber, and cooling means to cool said lower floor and said lower outlet opening of said reaction chamber, said cooling means being connected in series or in parallel with said cylindrical mantle.

7. The fluidized-bed reactor of claim 1, wherein said first part and said second part of said reaction chamber are the upper part and the lower part, respectively, of said reaction chamber.

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